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Note concerning Diffraction Phenomena, &c.
By H. F. Newall, M.A.

I regret that my effort to make my note (*Monthly Notices*, lviii. [present volume], p. 3) as short as possible has led Mr. Wadsworth to think that I have done injustice to his work by the appearance of wholesale criticism. I had hoped to guard against this appearance by the explicit reference which I made to "results obtained with large and small reflectors and refractors"; and I cannot think that my intention was generally misunderstood. I am only sorry that a great press of business before leaving for India last winter made me forget my original intention of sending my note in manuscript to Mr. Wadsworth.

I am unwillingly led to believe that silence on my part now would be misunderstood. But I have little or nothing to add to what I have already said, except perhaps that it would not occur to me to interpret the paragraphs in the *Encyclopædia Britannica* in the way that Mr. Wadsworth has done. The lines quoted by him cannot be regarded as the *conclusion* of a line of argument, as Mr. Wadsworth represents them to be (*Astrophysical Journal*, vii. p. 79); on the contrary they form the introduction to a very elegant treatment of a special example of illumination near the border of an image; and, though they contain statements which are not rigorously consistent, the meaning is beyond doubt clear. Lord Rayleigh is there dealing with a case in which the *scale* of the diffraction pattern does not come into consideration, and consequently there is no need to consider the focal length in the expression for the total illumination.

On the Actinic Qualities of Light as Affected by Different Conditions of Atmosphere. By the Rev. J. M. Bacon.

Apart from its relation to photography, this inquiry is of importance to the astronomer as involving considerations with regard to definition, the choice of observing stations, &c.

I have been led step by step to the conclusions at which I have arrived by the following series of tests often and variously repeated :—

Using in all cases uniform samples of sensitised paper or films, and as far as possible eliminating all accidental sources of error, I have, by means of subdued and prolonged exposures, made comparisons between the action of light proceeding from grey or blue sky.

(1) After traversing a length of tube admitting no extraneous light and containing only air at the surrounding temperature.

(2) After traversing the same tube containing various admixtures of smoke and floating mote particles of different kinds.

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Here, as was expected, the action of the light was impeded in proportion to the presence of foreign matter.

Similar experiments being repeated with the same media, but diffused light being at the same time freely admitted on all sides, it was found easy so to arrange matters that a slight addition of white smoke rendered the action of the light more rapid, doubtless owing to myriad reflections from the surfaces of its particles

Next, experiments similar to the above were made with air at normal temperature, which was compared with air variously heated. Here currents, condensation, &c., being as far as possible avoided, it was generally found that heated air retarded photographic action until the sensitive surface itself became materially heated, when action might be considerably accelerated.

Yet more marked comparisons were obtained between the effect of ordinary air and the air in which spirit was evaporating. In these cases as the air became charged and its temperature lowered by the evaporation, action was always accelerated in a striking degree.

This is but our familiar experience. In moist weather the distance is blue, clear, and sharp. In warm dry weather distance becomes grey and fades out. In an east wind all things are grey.

Those accustomed to out-door photography are aware how overpoweringly dazzling their sitters will often find the daylight after rain, even though the sky be overcast. Thus in moist weather the atmosphere would seem to be not only more transparent but to convey more diffused light, and it does not suffice as an explanation that floating foreign matter has been cleared away.

In India, at the time of the late eclipse, rain having been absent for a long period, it was found that the action of even the brightest sun on a photographic plate was far less rapid than might have been expected, and became markedly more energetic subsequently when rain clouds overcast the sky. This I exemplified by various photographic views which were projected on the screen at the last meeting of the Society.

At the same meeting I exhibited a series of photographic landscape pictures taken at regular intervals and with uniform exposure while the eclipse was in progress, which pictures went to show that the slow shutting off of the light, commonly noticed before totality, and its rapid return after totality was an actual fact, and not a mere subjective phenomenon. With reference to this Professor Turner has suggested that the explanation may lie in the sudden condensation of moisture occasioned by fall of temperature. The moisture thus condensed had clearly existed previously in the air only in finer subdivision, and its exalted power of transmitting light would seem due to its coalescing in larger particles. It is quite otherwise condensed when the "water dust" produces only the veiling of mist.

Have we some sort of analogy here in the passage of light through grains of, say, broken glass or crystal? The more minute

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the grains, *i.e.* the more molecular continuity is destroyed, the more is the light scattered and lost. May it not be so also with regard to moisture particles in suspension? The more subdivided they are, the greater number of limiting surfaces are there to scatter and impair the light.

But I am led to conceive that the intensity of light reaching us from the sky is occasionally influenced by another cause. Arago and others have pointed out, not only the familiar fact that clouds may be luminous, but that certain fogs may be phosphorescent, and they suggest that some such cause may account for certain abnormally light moonless nights; but I would go further and suggest that even clear sky may be phosphorescent also. We are familiar with various bodies often microscopic, in life or death, fitfully phosphorescent. Various noctilucæ render the ocean at times luminous, and light up the actual horizon. Are there no microcosmic organisms in higher strata of the ocean above us which behave similarly?

Again, phosphorescence of such organic matter as may well be in suspension in the atmosphere is thought to be connected with the presence of ozone, which in the atmosphere is a varying quantity. And, again, if it be actually true that it is often "darkest before dawn," then it is conceivable that there may be floating particles of the nature of phosphorescent sulphides or luminous pigments which lose their luminescence as the night proceeds.

A series of experimental photographic records seem to indicate that varying tracts of the night sky are occasionally to some extent self-luminous, but these results need further confirmation on clear moonless nights.

On some Attempts to Counteract by Instrumental Adjustments certain Effects of Refraction in Stellar Photography. By Arthur R. Hinks, B.A.

(*Communicated by Sir R. Ball.*)

Attention has recently been called to the possibility of counteracting to a large extent by instrumental adjustments the effects of refraction in displacing by a continually varying amount the field to be photographed. Dr. Rambaut has shown (*Monthly Notices*, 1896, vol. lvii. p. 50) that the variation with the hour-angle of the component in R.A. of the refraction can be met by suitable changes in the rate of the driving clock. When the polar axis of the telescope is adjusted to the true pole, the requisite change of rate for stars of small north polar distance becomes very large. Mr. Davidson has shown (*Monthly Notices*, 1897, vol. lviii. p. 4) that this difficulty can be overcome